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EVALUATION OF MOUNTAIN PINE BEETLE AND DWARF MISTLETOE DAMAGE IN DARK CANYON, UINTA-OURAY INDIAN RESERVATION, UTAH

By

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INTRODUCTION

On August 30 to September 2, 1982, Plant Pathologist, LaGrande Hobbs, and Biological Technical, Paul Fredrick, of Forest Pest Management (FPM) and Robert Reyos, Forestry Technician, Bureau of Indian Affairs (BIA), conducted a survey of timber in the Dark Canyon area of the Uinta-Ouray Indian Reservation. The purpose of the survey was to determine the extent and trend of mountain pine beetle and dwarf mistletoe infestations in Dark Canyon.

GENERAL INFORMATION

INSECT: Mountain pine beetle, Dendroctonus ponderosae Hopkins.

DISEASES: Dwarf mistletoe, Arceuthobium americanum, Comandra Rust, Cronartium comandrae.

HOST: Lodgepole pine.

LOCATION: Cottonwood Creek and Dry Gulch, Dark Canyon, Uintah-Ouray Reservation, Utah.

EXTENT OF INFESTATION: See map depicting the area surveyed - Figure 1.

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EXPERIMENT STATION

METHODS

The survey consisted of two compass transects through the length of two drainages. One transect ran from the top limit of the lodgepole pine (LPP) type to the bottom of the northeast facing slope in the Cottonwood Creek drainage (Dark Canyon). The other transect started near the high point between Dark Canyon and the Dry Gulch drainages and ran down the southwest facing slope of the Dry Gulch drainage to the ponderosa pine type (Figure 1). Variable-radius plots were established at 10 chain intervals along the transects using a Relascope and a basal area factor of 10. Data was collected on 24 plots in Cottonwood Creek and on 21 plots in Dry Gulch. Diameter at breast height (DBH) and tree height was recorded for each tree 6 in. DBH or larger. Trees were classified as living, beetle-infested (new attacts) or older dead.

Any noticeable disease infecting the trees was recorded and a dwarf mistletoe rating (Hawksworth 1977) was given to dwarf mistletoe infected trees. Basal area, stems per acre, and cubic foot volumes of new beetle infested, old dead and live green trees were calculated.

RESULTS

COTTONWOOD CREEK: The northeast slope of Cottonwood Creek is composed primarily of LPP (90%) with subalpine fir (SAF), Engelmann spruce (ES), Douglas fir (DF) and aspen (AS) comprising the remaining stand composition (Table 1). Regeneration is composed of LPP (49.5%) and SAF (45.1%) (Table 2). Basal area for LPP ranged from 40 to 190 sq. ft. per acre. The average age of the LPP is 104 years with a range of 65 to 130 years old.

Seventy-five percent of the total volume (2797.9 CF/AC) is in live trees, 16 percent is beetle-infested, and 8 percent is older dead (Table 3). The average DBH for LPP is 8.6 inches with 95 percent of the trees less than 12 inches in diameter (Figure 2).

Heavy dwarf mistletoe (DM) infection was found on 5 plots (plots 16-20) in the lower part of the drainage (Table 4). In these plots 100% of the LPP was infected with an average infection rating of 5. Three other plots (1, 2 and 7) had lighter levels of infection. Comandra rust was found in three of the 24 plots (Table 5). Plot 9 had 13 of 15 trees with rust-killed tops; the other two plots had a low level of scattered infection.

DRY GULCH: The southwest slope of Dry Gulch in Dark Canyon is almost entirely composed of LLP (96.3%) with some subalpine fir and Engelmann Spruce (Table 1). Regeneration on the slope is 100 percent LPP (Table 2). Basal area for LPP ranged from 70-200 sq. ft. per acre with an average of 126 sq. ft. per acre. The average age of LPP trees is 119 years with a range from 51 to 200 years old.

The total volume per acre in this drainage is 2,505.3 cu. ft., of which 78 percent is in live trees, 12 percent is beetle-infested, and 10 percent is older dead (Table 6). The average DBH for LPP is 10.0 inches with distribution scattered from 6 inches to 18 inches (Figure 2).

Dwarf mistletoe infections were not found on this slope. Comandra rust was detected in three of 20 plots indicating a low level of scattered infection (Table 5).

DISCUSSION

Lodgepole pine stands in elevations from 7000 to 9500 feet, are susceptible to mountain pine beetle attack when the average DBH exceeds 8 inches and the average age exceeds 80 years old (Amman, et. al. 1977). The Dark Canyon area, Cottonwood Creek and Dry Gulch, have stands exceeding 100 years old with an average DBH exceeding 8 inches. These factors predisposing the Dark Canyon area to mountain pine beetle attack, coupled with the presence of an outbreak just to the east in the Ashley NF, indicate that increased losses to mountain pine beetle will continue to occur over the next several years.

The band of young ponderosa pine along the bottom of both drainages is also susceptible to mountain pine beetle attack. A heavy infestation in the LPP will likely infest the ponderosa pine.

In areas where DM occurs, the disease must be taken into account in making management decisions. If a stand is thinned, DM levels can be expected to intensify. This would probably occur in the Cottonwood Creek plots 1, 2, and 7. In plots 16-20 the present infection levels are so high that not much intensification can occur. In all cases DM will spread to any LPP regeneration near DM infected LPP. Where DM is a problem clear-cutting of areas 40 acres or more is recommended to prevent spread of the disease to regeneration.

Comandra rust is only a minor problem in the Dark Canyon area, but any time trees are to be cut in an area with rust, infected trees should be removed to help reduce the inoculum level.

MANAGEMENT ALTERNATIVES

Several management alternatives are available in the Dark Canyon area which will produce different effects on the future timber resource:

NO ACTION--Stands currently infested with mountain pine beetle will continue to experience mortality until a majority of the trees 8" DBH and larger have been killed. Stands that have sustained mountain pine beetle outbreaks typically lose 70 percent of their basal area. This amounts to about 40 percent of the largest stems on a per-acre basis. Sawtimber values will be reduced to salvage values.

Increased fire hazard can be a result of this alternative. Beetle-caused tree mortality produces fuels of all size classes. Increased fire surveillance may be necessary as a result of the infestation.

In those areas with DM infections, remaining trees will likely be infected and regeneration occuring in the openings created by mountain pine beetle mortality will become heavily infected with DM. A stand with an infected overstory over an understory allows for rapid spread of DM. Comandra rust will also gradually increase.

Salvage Logging--To reduce the fire hazard and utilize the dead wood, infested stands would be given high priority for salvage logging including post and pole sales and firewood sales. Salvage logging will not prevent the increased mortality from the beetle. This alternative will result in population increases similar to those of the No Action alternative.

Partial-Cut--Since beetles prefer larger diameter trees, partial cuts directed at trees over 8 inches DBH would be effective in minimizing losses. However, there are problems with partial cuts in lodgepole pine. Partial cutting tends to accelerate the spread of DM and intensify the level of infection on infected trees. Areas with DM infections should be clearcut in patches of at least 40 acres to reduce spread of DM from the sides. If this is not desirable and some trees are left, any residual overstory should be removed before regeneration is 10 years old or 3 feet tall. Five years after establishment of regeneration, the edges of stands contiguous to these 40 acre cuts could be thinned to reduce DM spread. Nonhost species such as spruce and fir can be retained as a barrier to infection. Areas with high potential for blowdown of residual trees could also be clearcut.

Protective Spraying--Sprays are available which can protect LPP from beetle infestation for 2 years. Sevimol (R)4 is a carbaryl based insecticide that is registered as a protective spray. Cost is high and spraying is only recommended for high value trees such as those in campgrounds and other developed sites.

RECOMMENDATION

It is recommended that the Partial-Cut option be initiated as soon as possible. This Option provides for harvest of timber at its highest value before being killed by mountain pine beetle and would aid in DM control. Regeneration would be protected from infection by DM. The alternative would promote healthy, vigorous tree growth. In addition, as trees are marked for cutting, the few generally scattered trees infected with comandra rust could be marked and later cut, thus slowing the spread of this pathogen.

LITERATURE CITED

Amman, Gene D., Mark D. McGregor, Donn B. Cahill, and William H. Klein. 1977. Guidelines for reducing losses of lodgepole pine to the mountain pine beetle in unmanaged stands in the Rocky Mountains. USDA Forest Service, Gen. Tech. Rep. INT-36, 19p.

Hawksworth, F. G. 1977. The 6-class dwarf mistletoe rating system. USDA Forest Service. Gen. Tech. Rep. RM-48.

Table 1. Stand composition (%) for Dark Canyon.

Species	Cottonwood Creek	Dry Gulch
Lodgepole pine	90.0	96.3
Subalpine fir	2.3	1.9
Engelmann spruce	3.0	1.9
Douglas-fir	1.3	
Aspen	3.4	

Table 2. Relative frequency (stems per acre) of regeneration by species in Dark Canyon.

Species	Cottonwood Creek	Dry Gulch
Lodgepole pine	229.2 (49.5%)	76.2 (100.0%)
Subalpine fir	208.3 (45.1%)	0
Engelmann spruce	8.3 (1.8%)	0
Douglas-fir	16.7 (3.6%)	0
Total all spp.	462.5 (100.0%)	76.2 (100.0%)

Table 3. Mean stems per acre (S/A) and cubic foot volume per acre (CF/A) of lodgepole pine by diameter class and condition on northeast slope of Cottonwood Creek, Dark Canyon.

Diameter Class (in.)	Height (ft.)	Live		Infested		Dead	
		S/A	CF/A	S/A	CF/A	S/A	CF/A
6	47	161.3	772.4	6.4	30.5	6.4	30.5
8	48	88.3	692.5	9.5	74.9	7.2	56.1
10	65	35.1	541.7	9.2	141.3	3.1	47.1
12	61	3.2	65.1	7.4	152.0	2.7	54.3
14	61	0.8	21.4	1.2	32.1	1.6	42.8
16	-	-	-	0.6	21.9	-	-
18	65	0.2	11.2	-	-		
20	-	-	-	-	-	-	-
22	60	0.2	9.9	-	-	-	-
Total all Classes		289.1 (84%)	2114.2 (76%)	34.3 (10%)	452.7 (16%)	20.8 (6%)	230.9 (8%)

Table 4. Dwarf mistletoe rating (DMR) and occurence by plot for Cottonwood Creek, Dark Canyon.

Plot#	# Live Infect. Trees	% Infect.	Avg. DMR
1	2	22%	1.5
2	1	11%	2
7	1	20%	3
16	8	100%	5
17	7	100%	5
18	4	100%	6
19	3	100%	6
20	15	100%	3

Note: No infections on southeast slope of Dry Gulch.

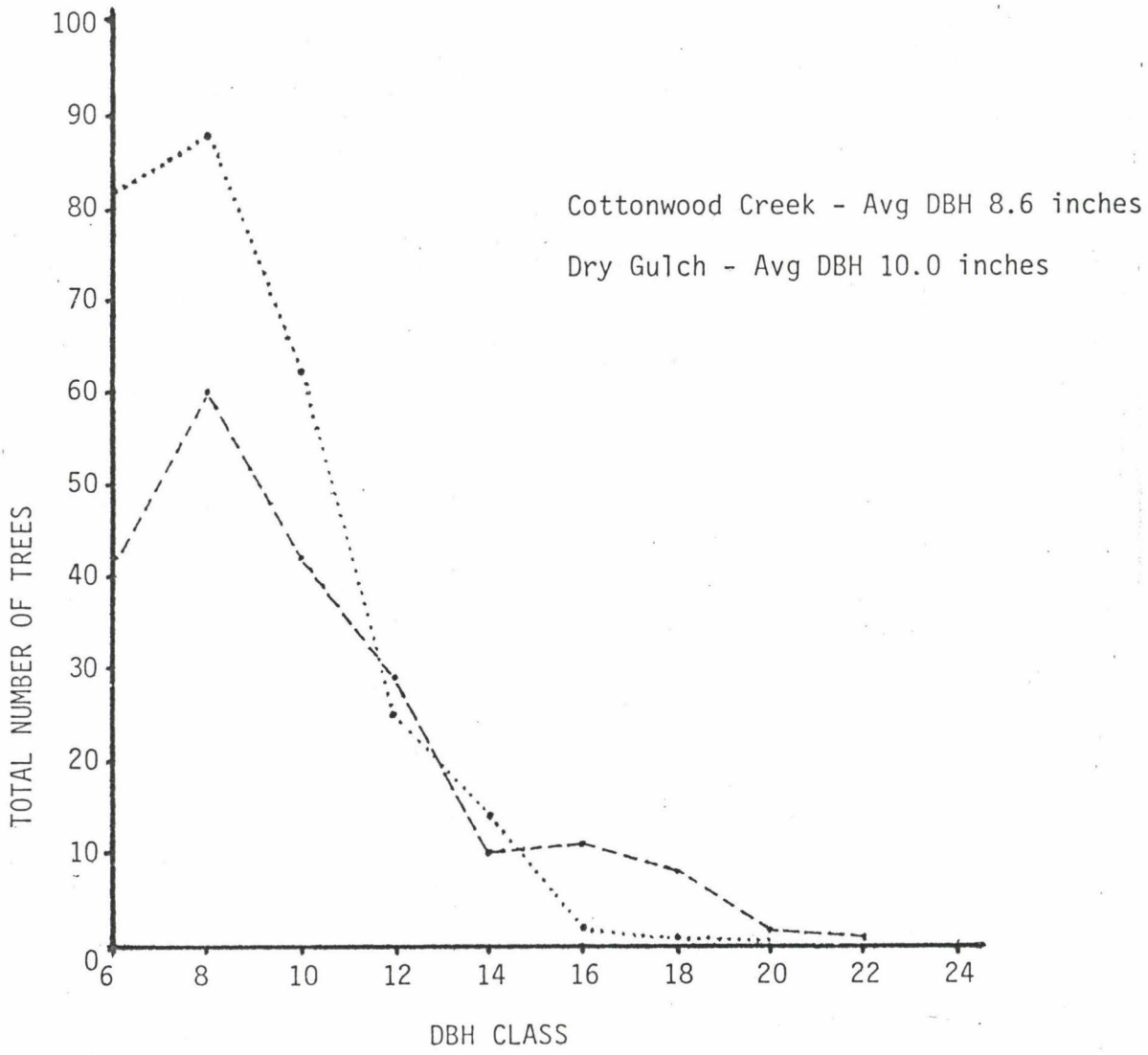
Table 5. Number of lodgepole pine and cubic foot volume per acre (CF/AC) infected by comandra rust.

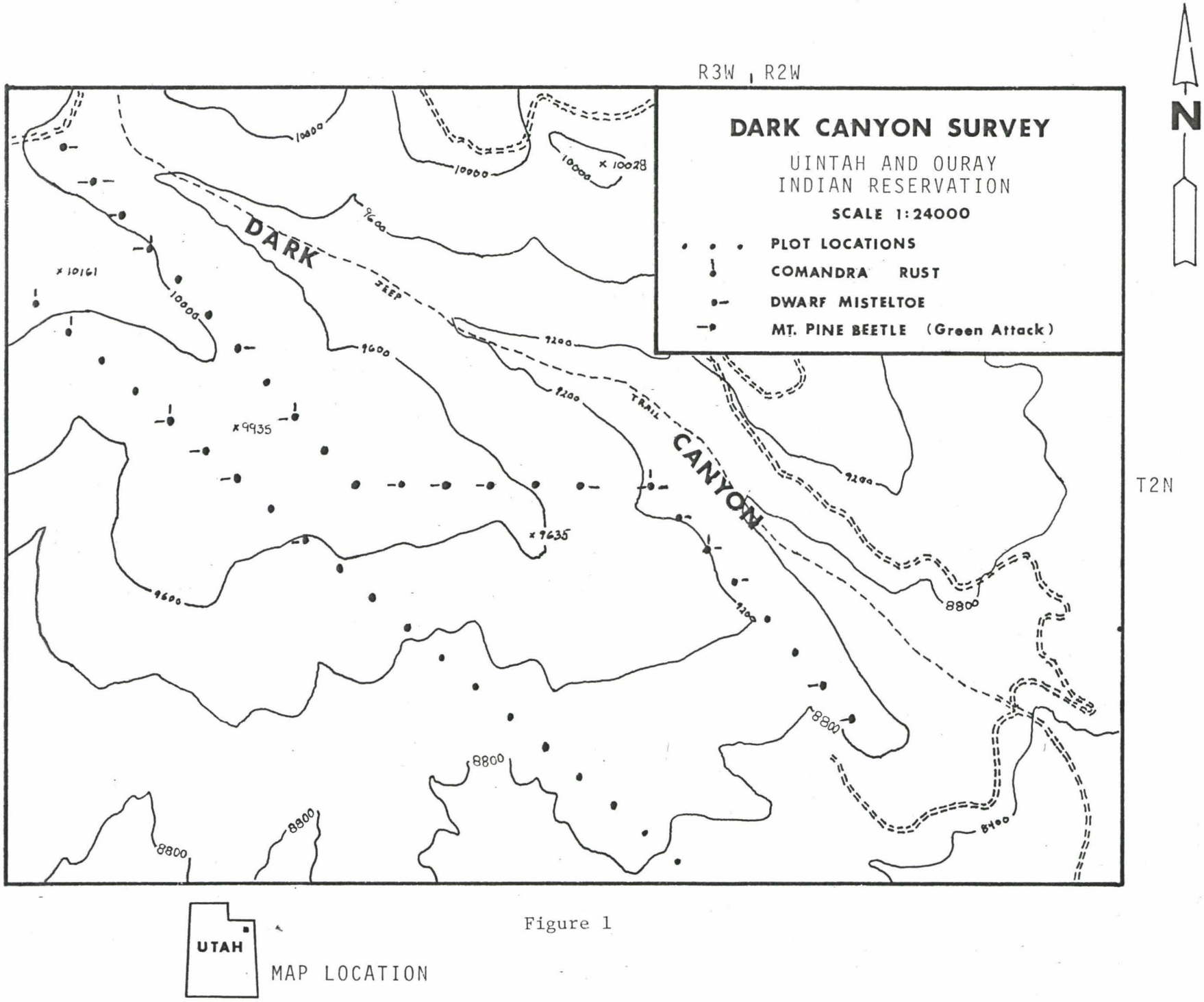
Area/Plot	No. Live Trees Infected	CF/AC
Cottonwood Creek		
4	1	10.8
9	13	221.2
17	1	9.4
Dry Gulch		
1	1	12.3
2	1	13.5
5	1	10.0

Table 6. Mean stems per acre (S/A) and cubic foot volume per acre (CF/A) of lodgepole pine by diameter cl. and tree condition on southwest slope of Dry Gulch, Dark Canyon.

Diameter Class (in.)	Height (ft.)	Live		Infested		Dead	
		S/A	CF/A	S/A	CF/A	S/A	CF/A
6	36	101.9	398.7	-	-	5.1	19.9
8	57	83.1	757.0	-	-	2.9	26.1
10	56	34.8	467.7	1.8	24.6	1.8	24.6
12	51	13.4	231.0	4.5	77.0	0.6	11.0
14	56	1.9	47.3	0.9	23.7	1.9	47.3
16	65	1.1	40.6	1.8	67.7	1.1	40.6
18	67	0.3	13.9	1.1	55.5	0.8	41.6
20	80	-	-	0.2	16.4	0.5	32.9
22	65	-	-	0.2	12.8	0.2	12.8
24	75	-	-	0.2	14.4		
Total all Classes		236.4	1956.3	10.7	292.1	14.9	256.9
		(90%)	(78%)	(4%)	(12%)	(6%)	(10%)

Figure 2. Diameter distribution for Lodgepole Pine in Cottonwood Creek and Dry Gulch.

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DARK CANYON SURVEY
UINTAH AND OURAY
INDIAN RESERVATION
SCALE 1:24000
PLOT LOCATIONS
COMANDRA RUST
DWARF MISTELTOE
MT. PINE BEETLE (Green Attack)
DARK
JEEP
TRAIL
CANYON
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9600
9200
8800
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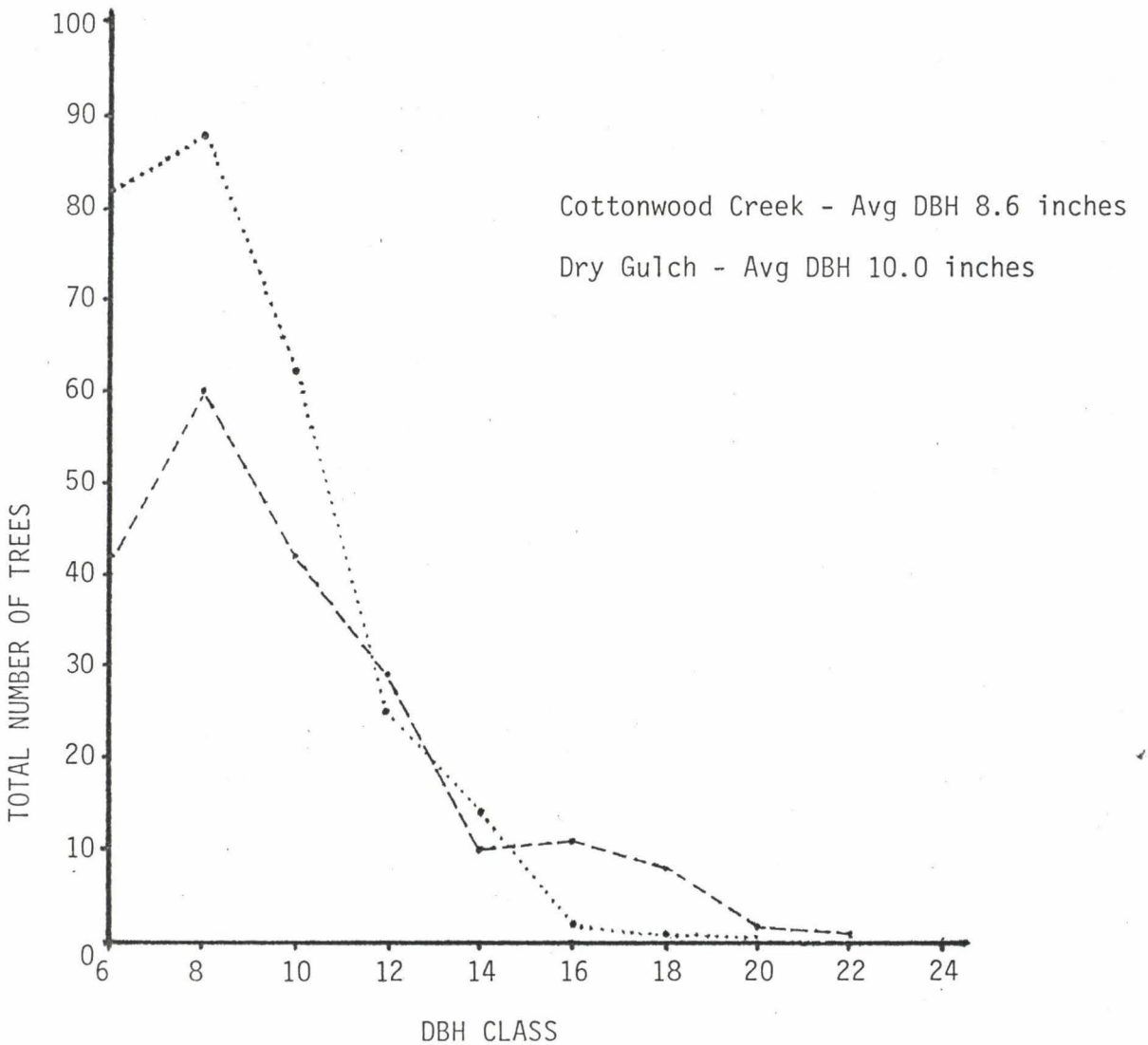
UTAH
MAP LOCATION

Figure 1

Figure 2. Diameter distribution for Lodgepole Pine in Cottonwood Creek and Dry Gulch.



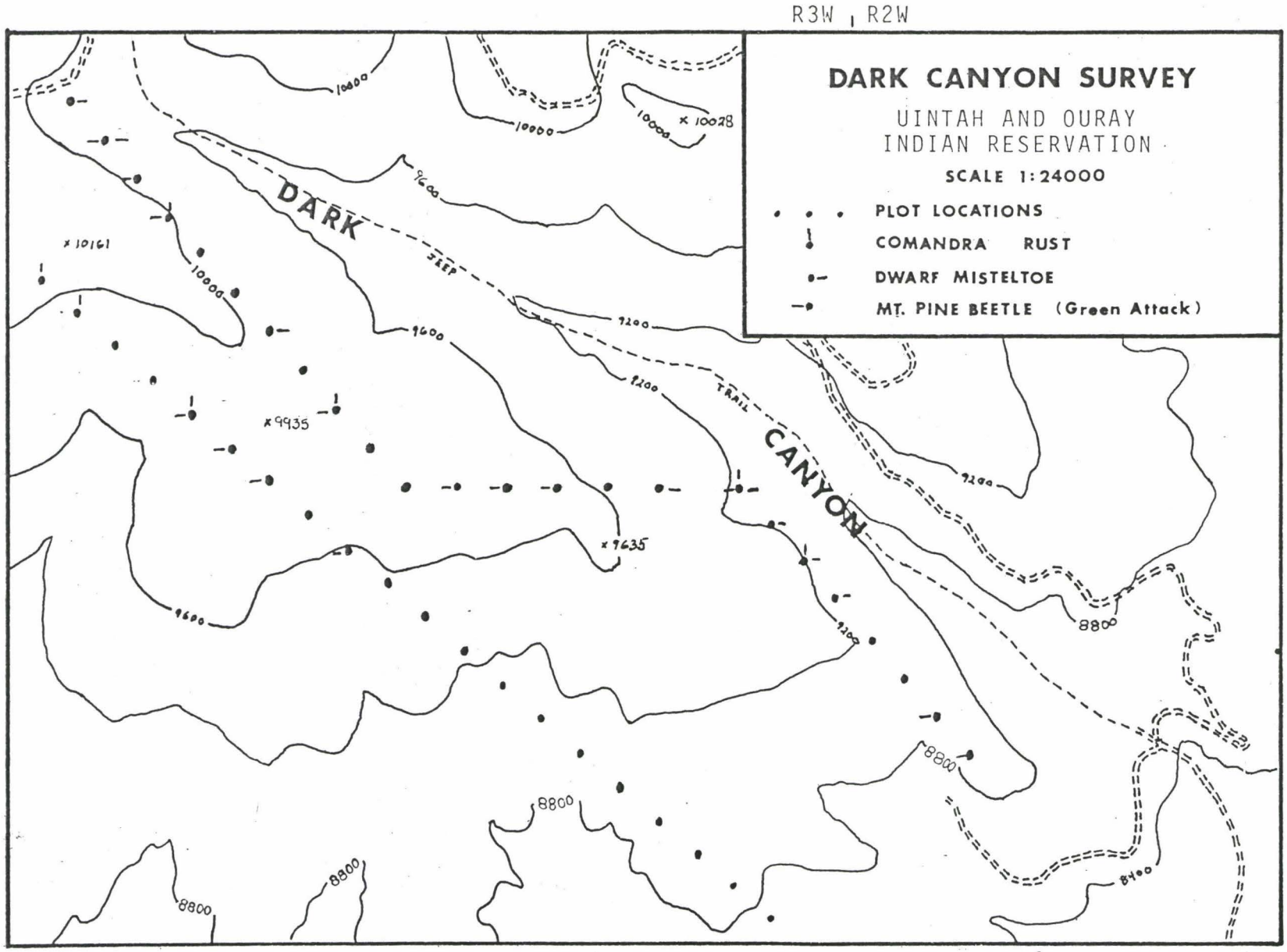

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Figure 1